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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,856	04/09/2004	Min-Lung Huang	HUAN3261/EM	8686

23364 7590 11/16/2006

BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314

EXAMINER

KALAM, ABUL

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 11/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/820,856	Applicant(s) HUANG, MIN-LUNG	
	Examiner Abul Kalam	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. **Claims 5 and 6** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The instant specification does not clearly and specifically teach wherein the wetting layer is nickel or titanium. Although on page 6 of the specification, the applicant discloses in a general statement that the adhesive layer, first barrier layer and wetting layer may comprise...(the list includes numerous materials including nickel and titanium). However, applicant does not specifically state that wetting layer may be a nickel layer or a titanium layer. Furthermore, titanium is commonly used as an adhesive layer and nickel is commonly used as a barrier layer. Thus, for examination purposes, the Office will interpret claim 5 to mean that the first barrier layer is nickel and claim 6 to mean that the adhesive layer is titanium.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2814

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1, 2 and 4** are rejected under 35 U.S.C. 102(b) as being anticipated by **Mis et al. (US 5,767,010)**.

With respect to **claim 1**, **Mis** teaches (**FIGS. 5 and 6**) an under bump metallization structure applicable to be disposed on bonding pads (**24**) of a semiconductor wafer, wherein a passivation layer (**26**) covers the wafer and exposes the bonding pads, the under bump metallization structure comprising:

an adhesive layer (**28**) formed on the bonding pads (**24**);
a first barrier layer (**30**) disposed on the adhesive layer (**28**);
a wetting layer (**32**) formed on the first barrier layer (**30**) (**col. 4: Ins. 11-27**); and
a second barrier layer (**34'**) disposed on the wetting layer (**32**) (**col. 5: Ins. 58-67**), wherein a material of the second barrier comprises tin and copper (**Cu₃Sn**).

With respect to **claim 2**, **Mis** teaches the structure of claim 1, as set forth above, wherein the quantity of the tin is smaller than the quantity of the copper (**Cu₃Sn**) (**col. 5: Ins. 58-67**).

With respect to **claim 4**, **Mis** teaches the structure of claim 1, as set forth above, wherein the wetting layer (**32**) is a copper layer (**col. 4: Ins. 21-27; chromium-copper is a copper alloy, and thus is considered a copper layer**).

With respect to **claim 6**, **Mis** teaches the structure of claim 1, as set forth above, wherein the adhesive (**28**) layer is titanium (**col. 4: Ins. 11-27**).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 3 and 5** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Mis (5,767,010)**, as applied to claim 1 above, and further in view of **Michael (US 5,563,102)**.

With respect to **claims 3 and 5**, **Mis** teaches all the limitations of claim, as set forth above in claim 1, with the exception of disclosing: wherein the first barrier layer is a nickel-vanadium layer or a nickel layer.

Mis does teach, however, that the first barrier layer **(30)** is formed of chromium **(col. 3: Ins. 11-27)**, and **Michael** teaches that a barrier layer may formed of materials such as nickel-vanadium or chromium **(col. 9: Ins. 9-15)**. Regarding claim 5, the nickel-vanadium is a nickel alloy, and thus is considered a nickel layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the structure of **Mis** with the teaching of **Michael**, to form the first barrier layer comprising nickel-vanadium, because it would have been considered a mere substitution of art recognized equivalent materials (MPEP 2144.06).

4. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mis (5,767,010)** as applied to claim 1 above.

With respect to **claim 7**, **Mis** teaches all the limitations of the claim, as set forth in claim 1 above, with the exception of disclosing: wherein the thickness of the second barrier layer is ranged from about 50 μ m to 80 μ m.

However, it would have been obvious to one of ordinary skill in the art to have a thickness of the second barrier layer in such a range as claimed, because absent evidence of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. See *In re Aller*, 220 F.2d 454, 105 USPQ 233, 234 (CCPA 1955).

Response to Arguments

Applicant's arguments filed on August 11, 2006 have been fully considered but they are not persuasive.

Applicant's argument that the titanium layer **28**, disclosed by **Mis (5,767,010)**, is not part of UBM layer, is not persuasive because the titanium layer **28** is formed under the solder bump **42** and directly connected to the bonding pad **24 (FIG. 6)**. Anything between the bonding pad and the solder bump can be considered a part of the under bump metallurgy.

Applicant's argument that titanium layer **28** is not an adhesion layer because **Mis** refers to it as a barrier layer, is not persuasive because titanium is commonly used in the art as an adhesion layer, and has the properties of both an adhesion and a barrier layer.

Applicant's argument that barrier layer of tin and copper is not disposed on the wetting layer, "but rather the layer is only formed from the interaction between the solder material and the top layer of the UBM," is not persuasive because the claim is drawn to a device and not a process of making.

A product by process claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a "product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

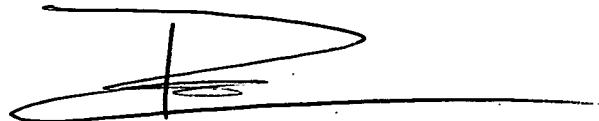
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Abul Kalam

A handwritten signature in black ink, consisting of a large, stylized 'L' shape with a horizontal line extending to the right and a vertical line intersecting it.

THAO X. LE
PRIMARY PATENT EXAMINER